



FINAL REPORT

Industry Trials of a Modified Sea Scallop Dredge to Minimize the Catch of Sea Turtles

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National Marine Fisheries Service
Northeast Fisheries Science Center
166 Water Street
Woods Hole, Massachusetts 02543-1026

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National Marine Fisheries Service
Northeast Regional Office
One Blackburn Drive
Gloucester, Massachusetts 01930-2298

Submitted by:

William D. DuPaul
David B. Rudders
Virginia Institute of Marine Science
College of William and Mary
Gloucester Point, Virginia 23062

and

Ronald J. Smolowitz
Coonamessett Farm
277 Hatchville Road
East Falmouth, Massachusetts 02536

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Introduction

Prior to 2000, there was very little concern that there was an interaction between scallop dredge gear and sea turtles. During the summer of 2000 scallop captains started to report to their technical advisors that they were observing sea turtles where they had rarely, if ever, seen them before and that some were coming up in the scallop dredges. Inquiries to National Marine Fisheries Service (NMFS) from industry discovered two key facts; loggerhead turtle populations may be on the increase and that there were few documented takes in scallop dredges (Table 1).

During 2001, the NMFS observers recorded 11 encounters between sea scallop vessels and sea turtles in the mid-Atlantic (5,286 observed hauls). The observed take, when expanded to overall fleet effort, provided an estimate of 95 turtles taken. In comparison, high observer coverage in recent years on Georges Bank has not record any turtle interactions. In 2002, over 20 turtle takes were reported for 72 observed trips into the Hudson Canyon Closed Area. In 2003 similar take rates were observed in other areas of the mid-Atlantic as well.

Clearly, turtles and scallop dredges were starting to have interactions. The uncertainty was how and why. Sea sampling reports that had been made public indicated that the turtles had been found wedged into forward parts of the dredge frame or in the bag where they may have been damaged by the dredge frame when the catch was dumped on deck. In addition, the turtle takes were being observed in a very limited geographical area when compared to the range of the sea scallop fishery. There were many theories of whether the interactions were occurring in the water column, on the bottom when the dredge was fishing or when the dredges were flared on the side of the vessel prior to setting.

A meeting was held at Coonamesett Farm on June 11, 2002 between NMFS, NEFMC, VIMS, and scallop industry technical advisors. After much discussion, there was general consensus on the following actions:

- (1) To produce a wheel house card to advise fishermen how to avoid interactions and how to respond to a take. Subsequently, the scallop industry and VIMS, with advice from NMFS, produced the card and distributed it to the fleet (Appendix 1).
- (2) To begin experimental testing of turtle excluder gear.
- (3) To use video camera gear to examine the behavior of turtles in association with scallop dredges.

- (4) To enhance training of NMFS observers to gain better quality data.

The development of concepts to minimize turtle interactions with sea scallop dredges had begun as soon as the scallop industry's technical advisors heard of the potential problem in 2001. The industry recognized that if a gear solution was not found to reduce the take rate; the mid-Atlantic might have to be closed from May through October, redirecting a large amount of scalloping onto Georges Bank and Gulf of Maine. This shift in effort would have impacts on groundfish rebuilding and thus risked further limiting of scallop fishing.

Methods to Deal with Interactions:

There are three general methodologies for reducing bycatch related mortality. They are (a) separate fishing activity in time and space from the species of concern, (b) exclude the species from the gear, and (c) if caught, release the species alive by proper handling. One or more of these approaches have been applied to reducing bycatch mortalities of fish, birds, marine mammals, and turtles.

In regards to the first approach, separation, there is very little data on the actual geographic location of the turtles in real-time and little understanding of their bottom foraging capabilities on sea scallop grounds (temperature and turtle species behavior are key). Some turtles continue to migrate through our area as the season progresses; others seem to remain in one area for the season. These factors indicate that to maintain scallop fleet/turtle separation would require a fast action notification system with full participation of the scallop fleet/observers. This is costly as a regulatory system and would be a least preferred approach.

The second method, exclusion, may be the easiest to achieve. Exclusion can be achieved by gear design and operating practice; the latter near impossible to regulate but can be very effective if implemented by industry.

Gear design modifications to the scallop dredge may be the best approach. Recent efforts to exclude flatfish and skates have shown significant results and possibly some of the modifications may work for turtles as well. The addition of excluder ring panels would prevent turtles from getting caught up in the dredge frame. Reports had indicated that some turtles were hauled up on top of the gear. Many were seen to swim away when the gear reaches the vessel. This may imply that the turtles are getting snagged on the gear, either the frame or the twine top, and being prevented from escaping either by being wedged, entangled, or held by the flow of water. Stopping the dredge/vessel before hauling back is a simple operational change that may eliminate some of the potential takes. Placing bars or rings between the depressor plate and bale may prevent any wedging of turtles in the frame.

A particular gear modification that the industry thought would work was to increase the number of up and down chains between the sweep, ticklers, and dredge

frame. This has the effect of preventing the bag from draping below the frame during hauling and setting; an opportune time to catch anything big in the water column.

The third methodology, handling the turtles that are taken onboard to avoid injury, can also be easily achieved on a scallop vessel. During the season and area when turtles are present, after the dredge gets to the block and in the air, the crewmen would be instructed to observe if there is a turtle before dumping the dredge on deck. If there is a turtle the captain and crew use the other side's tackle to bring the bale over to the other side of the boat and use that side's tackle on the club stick to gently dump the contents of the bag without ever dropping the dredge or bag on deck. This or a similar protocol would prevent the crushing of turtles when the catch is dumped on deck. The wheelhouse card was used as an educational tool to accomplish this task.

It had become evident that sea turtles could be caught by the scallop dredge in two different gear interaction scenarios. Firstly, sea turtles could be retained in the bag of the dredge and brought on board the vessel. Secondly, sea turtles could be retained/trapped on the outside top part of the dredge either on the bale, on the top part of the bag near the twine top, or trapped between the depressor plate and the cutting bar support struts. Most of the reports that were gathered from fishermen indicated that the most common interaction resulted in the turtle being retained in the scallop bag. In addition, many severe injuries to the sea turtles were caused when the dredge bag was dumped on deck.

For this study it was decided to implement a single gear change in an attempt to reduce the interactions with sea turtles. It is very difficult and impractical to implement two gear changes without understanding the implications of a single gear change.

Chain Design:

Industry and VIMS decided to work together on the development of turtle chains to keep turtles from entering the dredge bag as a first step in dredge modification. The following initial design criteria was developed:

- prevent turtles of >24" from entering dredge bag (6 ticklers by 11 or 13 up and downs)
- decrease the size and weight of the chains to keep impacts low
- increase chain hardness (grade) to minimize wear and stretching
- place tickler chains on top of up and down chains (allows gear to slide rather than dig)
- rubber cookies at each shackle to prevent wear
- minimize bottom impacts by keeping gear light

The scientists calculated that an arrangement of six ticklers and eleven up and downs on a fifteen foot wide dredge would require 200 feet of chain. Even with this quantity of chain there would be as much as a 32 inch diagonal between connection

points if the chains were hung in the typical rock chain fashion; draped from the sweep. The solution was to run the ticklers straight across attaching the ends to the main sweep chain. The function of the ticklers in this application is to maintain the spacing of the up and downs. The initial design was that the ticklers would be on top and thus would minimize the tendency to dig.

The following was the suggested chain grade and size:

Up and downs:	Grade: 70	Size: 5/16"	Load limit: 4700 lbs.
Ticklers:	Grade: 70	Size: 3/8"	Load limit: 6600 lbs.

Note: Grade 30 5/8" chain, common for ticklers, has a load limit of 6900 lbs.

2002 Field Trials:

In 2002, the NMFS provided limited funding to construct and test the turtle chains as a precursor to a scientific study. Five sea scallop vessels volunteered to participate in taking the turtle chains to sea for preliminary evaluation. Each vessel fished one side with and one side without the turtle chains. The higher powered vessels had higher catches with the chains; the lower powered vessels felt they had a reduced scallop catch using the chains. During the trials there were two turtle interactions. In one case the turtle was captured in the bag of the dredge without the chains. In the other case, the turtle was seen "hanging onto the chain mat when the dredge surfaced...then it swam away." The captain felt certain that the turtle would have been captured by the dredge if not for the chain mat.

The preliminary trials were very promising and the decision was made to submit an application for scallop TAC set aside to conduct a full scale scientific experiment. This report contains the preliminary results of the TAC project.

2003-04 Field Trials:

The gear trials for the turtle excluder chain dredge modifications were made possible through funding from two grants. The first was a grant made available through the NMFS Sea Scallop Research TAC Set-Aside program. This grant allowed participating vessels to recover some of the costs associated with using the turtle chains by receiving extra TAC while fishing in the Hudson Canyon Closed Area. It also provided funds to cover the cost of the research conducted by the Virginia Institute of Marine Science (VIMS) and Coonamessett Farm. In addition, one trip was designated as a Research Camera Cruise where underwater video was made of the modified dredge during normal fishing operations.

The Research TAC Set-Aside was augmented with a contract from NMFS, Northeast Fisheries Science Center (NEFSC) to provide trained observers for the participating fishing vessels. The objective of this contract was to ensure that trained

scientific data collectors documented both the bycatch of turtles as well as the catch of scallops and other finfish species in order to adequately determine the effectiveness of the gear modification. VIMS undertook the training of the observers by providing a full day of sea turtle biology, identification and necropsy. In addition, all observers received extensive fishing vessel safety training in accordance with the curriculum set forth by the Alaskan Marine Safety Education Association.

The experimental design for this study was straightforward. Only one of the vessel's two dredges were modified with the addition of turtle chains. The turtle chains are basically a modified rock chain arrangement constructed of lighter, but stronger chain. The vessels used 3/8" hardened steel chain in an arrangement to cover the opening of the dredge. For 14' and 15' dredges, 11 up and downs and six ticklers were used; for smaller dredges, 9 up and downs were used. Please see attached materials for a full description of the turtle chain and a photograph. Statistical analyses were conducted on the comparative catches of both sea turtles and sea scallops. A paired t-test at the $\alpha=0.05$ level was used to test for significance in catches between the dredge equipped with turtle chains and the control dredge (no chains).

Gear trials began on July 17, 2003 and were completed on October 9, 2004. In total, a series of 22 experimental fishing trips were carried out with a total of 277 days and 3,248 observed tows. Tables 2 and 3 provide a complete summary of the trips. During the study, a total of eight turtle interactions were observed, all of them with the unmodified scallop dredge. Sea turtle catches were significantly lower ($p < 0.01$) in the modified dredge. The location and disposition of the sea turtles captured is listed in Table 4 and Figure 1. Seven of the eight captured turtles were loggerhead turtles, with the remaining turtle identified as a leatherback. Of the eight, three escaped uninjured and three were released with injuries sustained during capture or during the emptying of the dredge or when the dredge was brought onboard. One of the animals was killed when the dredge frame fell on the turtle and one was brought on board dead. In cases where the turtles were landed on the vessel, photographs were taken. Turtle measurements and vital statistics were recorded on a "turtle stranding form."

Scallop catches were highly variable from vessel to vessel and trip to trip (Table 5). On average, scallop losses averaged 6.76% less and the loss was statistically significant ($p < 0.001$). It is assumed that as vessel captains become more familiar with rigging the turtle chains, catch rates will become less variable and more consistent with the dredges without the modification. Finfish and invertebrate bycatch was also recorded and is shown in Table 6.

Figures 2-8 portray the vessel tow track during which a turtle interaction occurred. Also portrayed are the tracks of tows made prior to the turtle interaction. If turtle interactions are more common when one or several vessels concentrate fishing activities in a particular area, it may be helpful to examine the towing patterns of the vessels. In several cases, turtle interactions during this study occurred when the vessels were fishing in a relatively small area. It would be helpful to overlay the fishing activity of other vessels operating in the same area and at the same time. An important question

to be answered relates to the possibility that scallop vessels may be attracting the turtles to areas where fishing operations are concentrated.

In attempting to separate sea scallop fishing activities from areas where sea turtles are known to exist may be complicated by unknown factors. It is quite possible that the feeding behavior of sea turtles may be quite different in areas where there is no scallop fishing effort when compared to areas where several or many scallop vessels are conducting fishing operations. Sea turtles may be foraging on scallop viscera discarded by scallop vessels similar to schools of yellowfin and bluefin tuna. This phenomenon of aggregate feeding behavior may be further enhanced by the fact that concentrations of fishing vessels tend to stay in one location for extended periods of time as a result of area management strategies.

Summary:

In response to increasing numbers of sea turtle interactions observed by the sea scallop industry and subsequently corroborated by NMFS observers, a series of 22 experimental cruises were carried out during the summer and early fall of 2003 and the summer and early fall of 2004 on the continental shelf waters of the mid-Atlantic Bight. The objective of the cruises was to examine the efficacy of a modified commercial sea scallop dredge designed to reduce the bycatch of sea turtles in the sea scallop fishery. The modification consisted of a chain mat spanning the opening of the dredge mouth. The performance of the experimental gear was assessed by comparing a modified dredge fished simultaneously with an unmodified dredge. Results indicate that the modification was successful in eliminating the bycatch of turtles with relatively small reductions in the catch of the target species. A total of 3,248 tows in 277 days at sea were observed during the trials with eight sea turtles captured in the unmodified dredge and none captured in the modified dredge. Of the tows that were sampled by the observers, the modified dredge captured significantly ($p < 0.001$) less scallops relative to the unmodified dredge. On a percentage basis, the modified dredge captured 6.71% less scallops than the unmodified dredge. It is anticipated, however, that the difference in sea scallop catches will decrease over time as industry becomes more familiar with the use of the chain configuration. These cruises demonstrated that a simple modification to the standard sea scallop dredge can be effective in eliminating the incidence of sea turtle bycatch without substantial concomitant reductions in the capture of the target species.

Ancillary Activities:

The Fisheries Survival Fund and the Virginia Sea Grant Marine Advisory Program at VIMS produced two placards designed to instruct captains and crew about sea turtle interactions. Both of the placards are included as additional information to this interim report. As of May 20, 2004, over 300 of the placards designed to show the construction of the turtle chains have been distributed to vessel captains and owners. Industry has taken the proactive action of installing turtle chain dredge modification on vessels fishing in the mid-Atlantic.

Figure 1 Locations of turtle takes observed during the 2003-04 gear trials

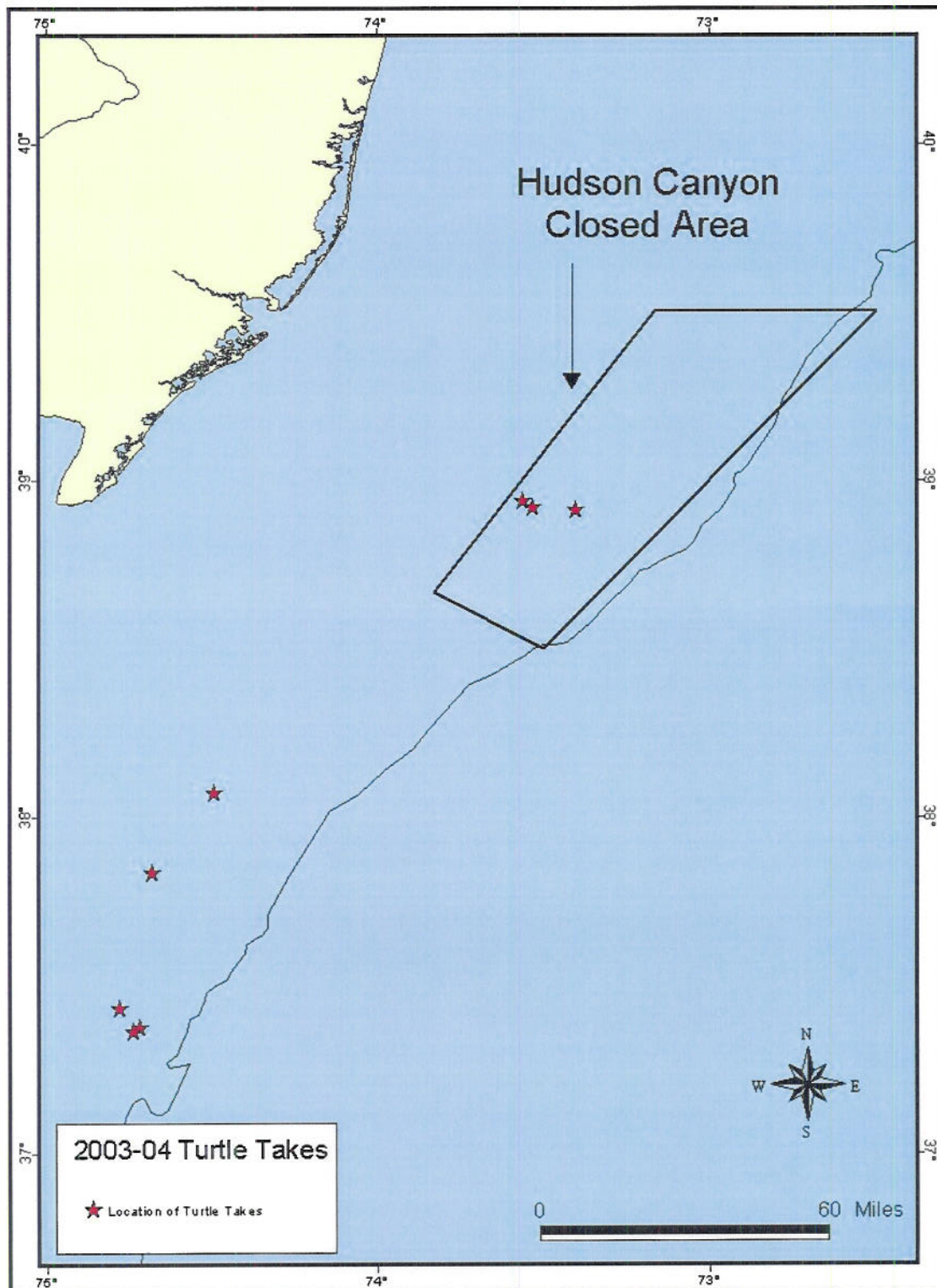


Table 1 Reports of Sea Turtle/Scallop Gear Interactions 1996-1999. Source: NMFS

Date	Home Port	Trip	Haul	Location	Depth in fathoms	Bottom Type	Species	Characterization of Take
07/11/1996	Newport News, VA	A41022	213	36° 54 N 74°52 W	24-68	rocky	loggerhead	Live loggerhead caught on bar of starboard dredge. Washed off as dredge broke surface. Animal did not appear to be injured. Estimated length of 60 cm.
09/07/1997	Barnegate Light, NJ	A24038	71	39°57 N 73°33 W	18-20	sand	green	Live green caught in forward portion of dredge and released with crowbar. Turtle sustained a crack in the carapace across the upper right lateral scutes. Animal released alive injured. Estimated length 70 cm.
09/09/1999	Cape May, NJ	B38017	30	40°06 N 73°47 W	15-18	sand	unknown	Turtle brought on board alive with a cracked carapace, possibly from rocks in the dredge. Released alive injured. Curved carapace length 106 cm.
09/15/1999	Cape May, NJ	B38017	69	40°13 N 73°46 W	16-18	sand	unknown	Severely decomposed small turtle entangled in old gillnet brought up in dredge. No measurements. Clearly not associated with dredge activity.

Table 2 Information for turtle excluder chain project. Cruises included represent both comparative and compensation trips
A * denotes tow logs maintained by captain/mate. A ** denotes turtle excluder chains not used on that cruise.

Trip	Vessel	Type of Trip	Date Departed	Date Returned	Trip Length	# of tows	Observer
1	Capt. Billy Haver	Open Area	7/11/2003	7/21/2003	11	125	David Rudders
2	Wilma & Irene	Open Area	7/17/2003	7/31/2003	15	220	John Walters
3	Bay Star III	Open Area	7/28/2003	8/10/2003	14	125	Vince Saba
4	Capt. Billy Haver	Open Area	7/31/2003	8/12/2003	13	154	Chip Cotton
5	Janice Lynell	Open Area	8/5/2003	8/16/2003	12	169	Chris Hager
6	Bay Star III	Open Area	8/15/2003	8/28/2003	14	101	Andrew Walker
7	Capt. Billy Haver	Open Area	8/24/2003	9/5/2003	13	168	David Rudders
8	Janice Lynell	Open Area	8/26/2003	9/8/2003	14	210	Wolf Lange
9	Westport	Camera Cruise	8/27/2003	9/4/2003	9	93	Bill DuPaul
10	Westport	Camera Cruise-comp	9/10/2003	9/25/2003	16	142	no observer coverage*
11	Celtic	Closed Area	9/6/2003	9/18/2003	13	181	Todd Gedamke
12	Kayla Rose	Closed Area	9/20/2003	10/1/2003	12	151	Andrew Walker
13	Kayla Rose	Closed Area	10/9/2003	10/21/2003	13	173	Andrew Walker
14	O'Neal's Pride	Closed Area	9/26/2003	10/16/2003	21	230	Andrew Taylor
15	Pursuit	Closed Area	9/28/2003	10/6/2003	8	107	not part of program, but data included*
16	Capt. Billy Haver	Closed Area	10/24/2003	11/12/2003	20	223	Andrew Taylor
17	Relentless	Closed Area-comp	11/4/2003	11/28/2003	-	-	no observer coverage**
18	Crystal&Rebecca	Closed Area-comp	12/2/2003	12/22/2003	-	-	no observer coverage**
19	Bay Star II	Closed Area-comp	11/15/2003	11/29/2003	-	-	no observer coverage**
20	Capt. Billy Haver	Closed Area-comp	12/3/2003	11/2/2004	-	-	no observer coverage**
21	Celtic	Closed Area	10/16/2004	10/27/2004	11	147	not part of program, but data included*
22	Defiant	Closed Area	6/22/2004	6/30/2004	9	61	Chris Hager
23	Celtic	Closed Area	7/7/2004	7/16/2004	10	107	Bill DuPaul
24	Relentless	Open Area	7/12/2004	7/19/2004	8	78	Andrew Walker
25	Bay Star III	Open Area	8/16/2004	8/28/2004	13	153	no observer coverage*
26	Defiant	Open Area	10/1/2004	10/9/2004	8	130	no observer coverage*
Total					277	3,248	

Table 3 Comparison of sea turtle bycatch between one dredge equipped with turtle excluder chains and one without the chain configuration on observed trips during 2003 and 2004.

Trip	Vessel	Company	Date		Trip Length	# of tows	Turtle Interactions	
			Departed	Returned			Unmodified Dredge	Modified Dredge
1	Capt. Billy Haver	Captain Juan Inc.	7/11/2003	7/21/2003	11	125	1	0
2	Wilma & Irene	Peabody	7/17/2003	7/31/2003	15	220	0	0
3	Bay Star III	Ches. Bay Packing	7/28/2003	8/10/2003	14	125	0	0
4	Capt. Billy Haver	Captain Juan Inc.	7/31/2003	8/12/2003	13	154	0	0
5	Janice Lynell	Peabody	8/5/2003	8/16/2003	12	169	2	0
6	Bay Star III	Ches. Bay Packing	8/15/2003	8/28/2003	14	101	0	0
7	Capt. Billy Haver	Captain Juan Inc.	8/24/2003	9/5/2003	13	168	0	0
8	Janice Lynell	Peabody	8/26/2003	9/8/2003	14	210	1	0
9	Westport	Westport Scalloping Co.	8/27/2003	9/4/2003	9	93	2	0
10	Westport	Westport Scalloping Co.	9/10/2003	9/25/2003	16	142	0	0
11	Celtic	Quinn Fisheries	9/6/2003	9/18/2003	13	181	0	0
12	Kayla Rose	A J Scalloping, Inc.	9/20/2003	10/1/2003	12	151	0	0
13	Kayla Rose	A J Scalloping, Inc.	10/9/2003	10/21/2003	13	173	0	0
14	O'Neal's Pride	Denny O'Neal	9/26/2003	10/16/2003	21	230	0	0
15	Pursuit	Eastern Fisheries	9/28/2003	10/6/2003	8	107	1	0
16	Capt. Billy Haver	Captain Juan Inc.	10/24/2003	11/12/2003	20	223	0	0
17	Celtic	Quinn Fisheries	10/16/2003	10/27/2003	11	147	0	0
18	Defiant	Wells Scallop Company	6/22/2004	6/30/2004	9	61	0	0
19	Celtic	Quinn Fisheries	7/7/2004	7/16/2004	10	107	0	0
20	Relentless	Wells Scallop Company	7/12/2004	7/19/2004	8	78	0	0
21	Bay Star III	Ches. Bay Packing	8/16/2004	8/28/2004	13	153	0	0
22	Defiant	Wells Scallop Company	10/1/2004	10/9/2004	8	130	1	0
Total						277	8	0

Table 4 Detailed information concerning sea turtle interactions during the experimental cruises comparing an unmodified dredge to one equipped with turtle excluder chains. Coordinates are in decimal degrees, depth is in fathoms and dredge size is in feet.

Take	Vessel	Date	Lat.	Long.	Closed		Tow time (hrs.)	Time of day	Dredge size	Towing speed (kts.)	Species	Disposition
					Area	Depth						
1	Capt. Billy Haver	7/15/03	37.84	74.68	no	24	1.33	19:45	11	4.0	Loggerhead	Dead
2	Janice Lynell	8/6/03	37.30	74.74	no	28	1.30	8:03	15	4.3	Loggerhead	Alive Released Injured
3	Janice Lynell	8/13/03	37.40	74.83	no	27	1.17	20:02	15	4.3	Loggerhead	Alive Released Injured
4	Westport	9/1/03	38.92	73.54	yes	27	1.03	12:30	15	4.0	Loggerhead	Alive Released Injured
5	Westport	9/1/03	38.99	73.49	yes	27	1.15	16:01	15	4.0	Loggerhead	Alive Escaped Uninjured
6	Janice Lynell	9/3/03	38.148	74.449	no	23	1.18	11:58	15	4.3	Loggerhead	Dead
7	Pursuit	10/1/03	38.90	73.37	yes	34	1.82	19:45	14	5.0	Loggerhead	Alive Escaped Uninjured
8	Defiant	10/2/04	37.36	74.74	no	30	1.16	22:42	14	4.1	Leatherback	Alive Released Uninjured

Table 5 Comparison of sea scallop catch (in baskets) between one dredge equipped with turtle excluder chains and one without the chain configuration. Scallop catch is from sampled tows on observed trips. Percent difference represents the difference in catch between the two dredges relative to the catch of the unmodified dredge.

Scallop Catch									
Trip	Vessel	Date		Trip Length	# of tows		Experimental	Control	% Diff
		Departed	Returned		on trip	sampled			
1	Capt. Billy Haver	7/11/2003	7/21/2003	11	125	45	444.00	469.25	-5.38
2	Wilma & Irene	7/17/2003	7/31/2003	15	220	54	303.25	387.00	-21.64
3	Bay Star III	7/28/2003	8/10/2003	14	125	50	619.00	744.00	-16.80
4	Capt. Billy Haver	7/31/2003	8/12/2003	13	154	61	567.00	609.80	-7.02
5	Janice Lynell	8/5/2003	8/16/2003	12	169	57	456.50	450.66	1.30
6	Bay Star III	8/15/2003	8/28/2003	14	101	77	2,342.00	2,387.00	-1.89
7	Capt. Billy Haver	8/24/2003	9/5/2003	13	168	54	434.98	487.25	-10.73
8	Janice Lynell	8/26/2003	9/8/2003	14	210	70	553.75	565.50	-2.08
9	Westport	8/27/2003	9/4/2003	9	93	17	191.75	194.75	-1.54
10	Celtic	9/6/2003	9/18/2003	13	181	99	892.00	879.05	1.47
11	Kayla Rose	9/20/2003	10/1/2003	12	151	68	930.00	885.00	5.08
12	Kayla Rose	10/9/2003	10/21/2003	13	173	75	898.00	873.00	2.86
13	O'Neal's Pride	9/26/2003	10/16/2003	21	230	82	538.90	779.75	-30.88
14	Pursuit	9/28/2003	10/6/2003	9	107	23	306.50	355.50	-13.78
15	Celtic	10/16/2003	10/27/2003	11	147	15	179.00	178.25	0.42
16	Capt. Billy Haver	10/24/2003	11/12/2003	20	223	70	704.00	898.00	-21.60
17	Defiant	6/22/2004	6/30/2004	9	61	12	208.50	216.50	-3.69
18	Celtic	7/7/2004	7/16/2004	10	107	14	187.75	175.00	7.28
19	Relentless	7/12/2004	7/19/2004	8	78	39	356.00	377.50	-5.69
Total				241	2,823	982	11,112.88	11,912.76	-6.71

Table 6 Finfish and invertebrate bycatch encountered during the testing of turtle excluder chain trials. Control indicates catch from dredge without chains. Experimental indicates catch from dredge equipped with excluder chains. Totals were calculated from 882 comparative tows.

	Experimental	Control
Spiny Dogfish	16	11
Unclassified Skates	25111	24726
Clearnose Skates	91	95
Silver Hake	18	35
Red Hake	509	477
Spotted Hake	588	589
Summer Flounder	144	165
Fourspot Flounder	1210	1504
Blackback Flounder	57	44
Grey Sole	71	61
Windowpane Flounder	354	300
Black Sea Bass	30	22
Northern Seabobin	12	12
Armored Seabobin	157	183
Monkfish	3854	3341
Unclassified Crabs	19	37

Figure 2

**Turtle Take #1
F/V Capt. Billy Haver
July 15, 2003**

- Start of tow
- End of tow
- ★ End of tow (where take occurred)
- ★ Start of tow (where take occurred)

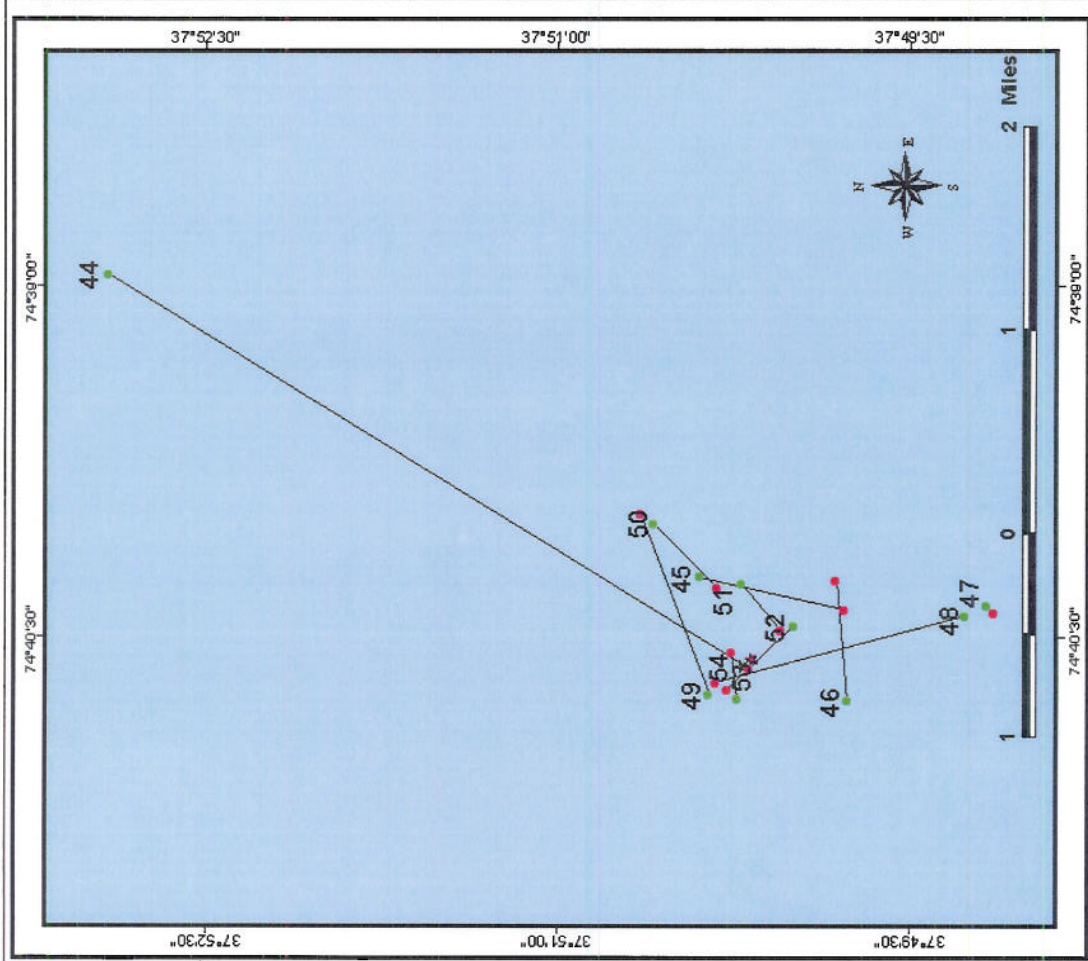




Figure 3

**Turtle Take #2
F/V Janice Lynell
August 6, 2004**

- # Start of tow
- # End of tow
-  End of tow
(where take occurred)
-  Start of tow
(where take occurred)

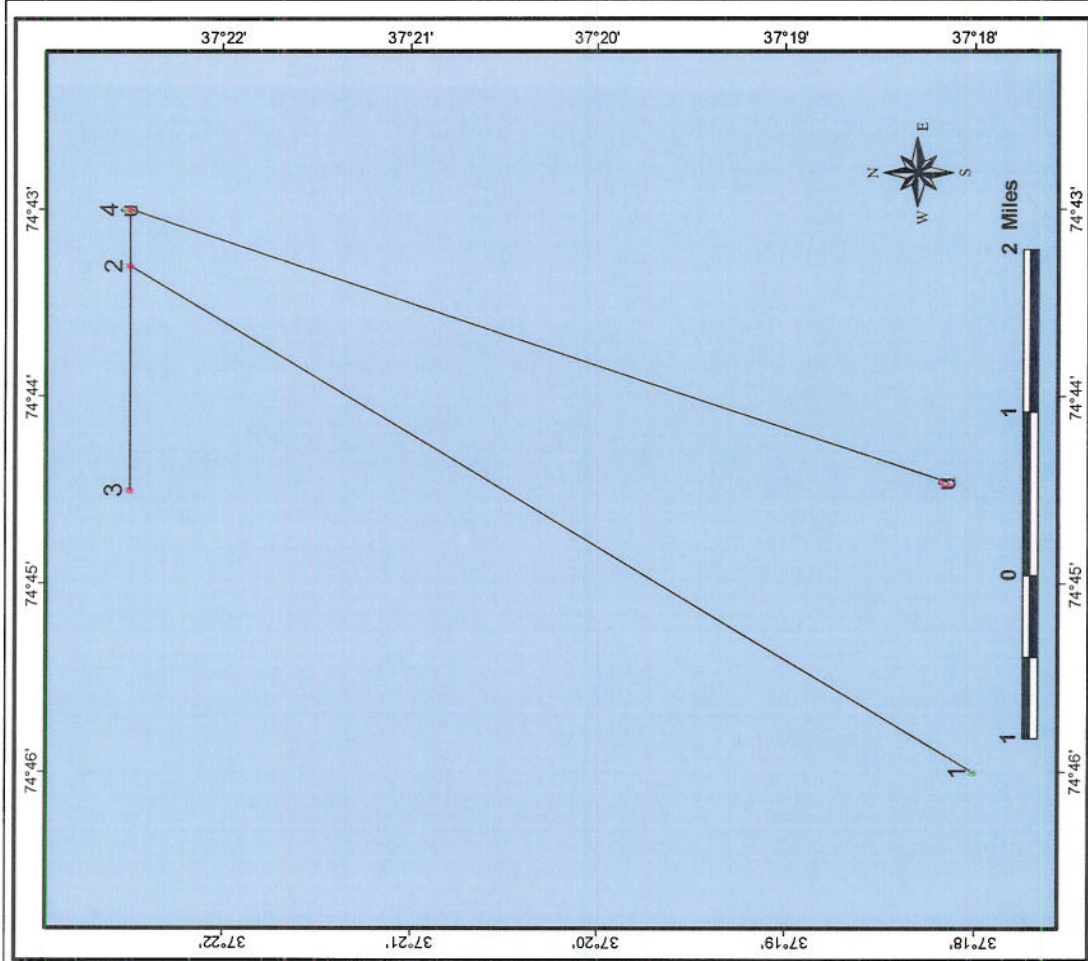


Figure 4

**Turtle Take #3
F/V Janice Lynell
August 13, 2004**

- # Start of tow
- # End of tow
- ⬮ End of tow
(where take occurred)
- ⬮ Start of tow
(where take occurred)

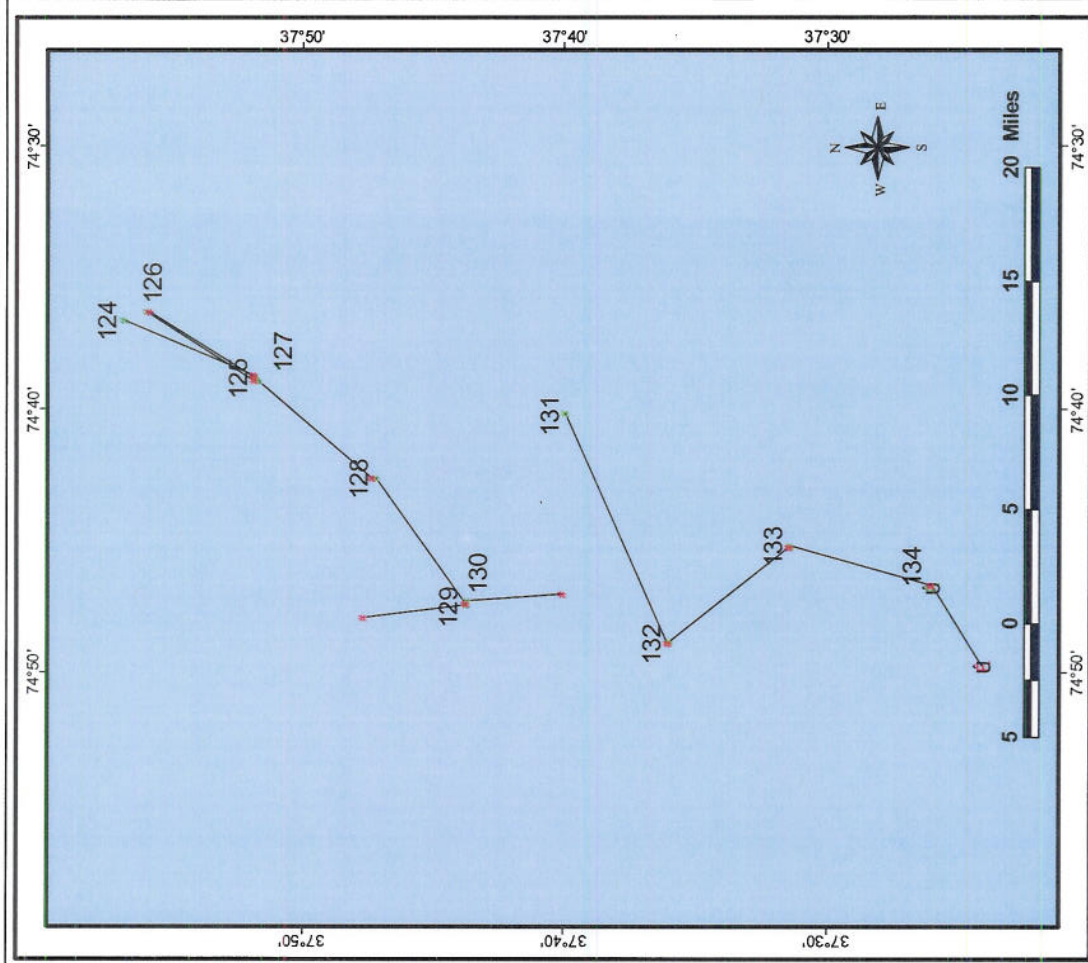




Figure 5

**Turtle Take # 4
FV Janice Lynell
September 3, 2003**

- # Start of tow
- # End of tow
-  End of tow
(where take occurred)
-  Start of tow
(where take occurred)

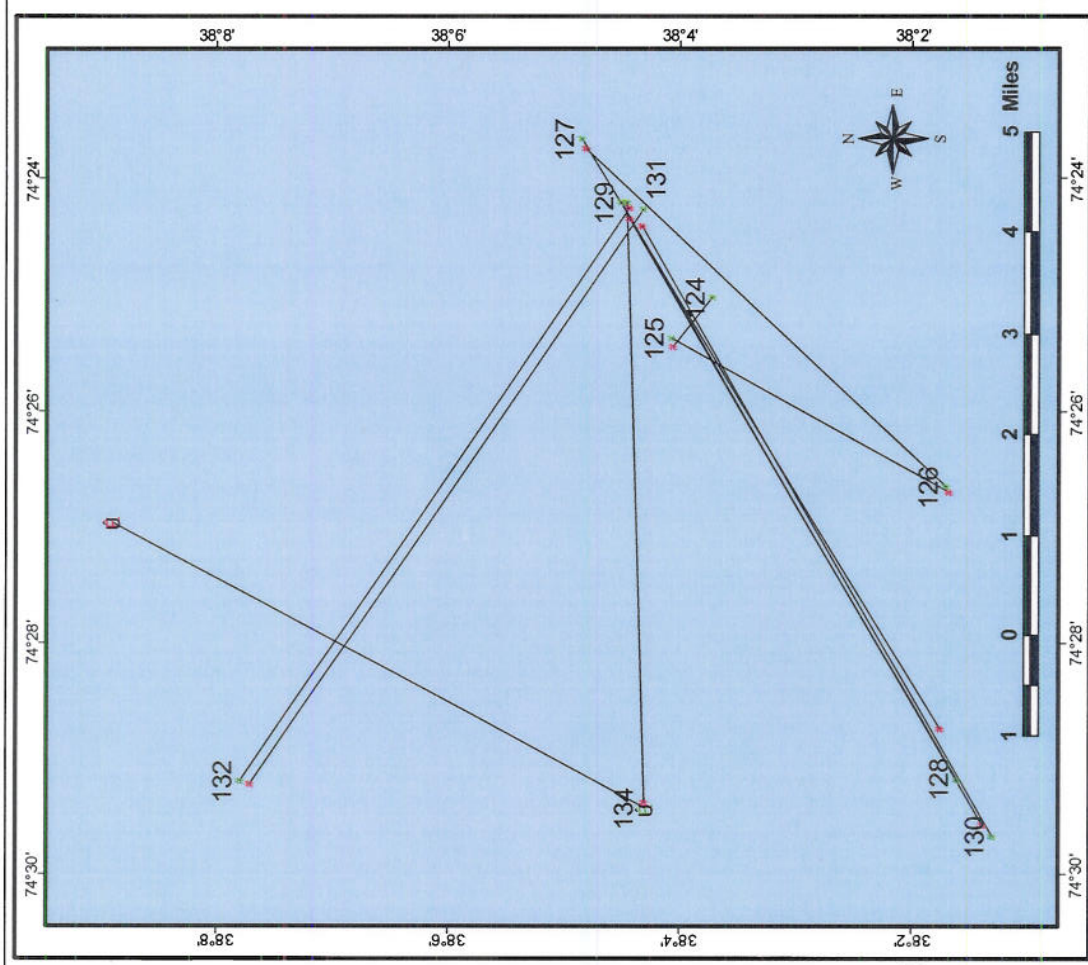


Figure 6
Turtle Takes 5 & 6
F/V Westport
September 1, 2003

- # Start of tow
- # End of tow
- End of tow (where take occurred)
- Start of tow (where take occurred)

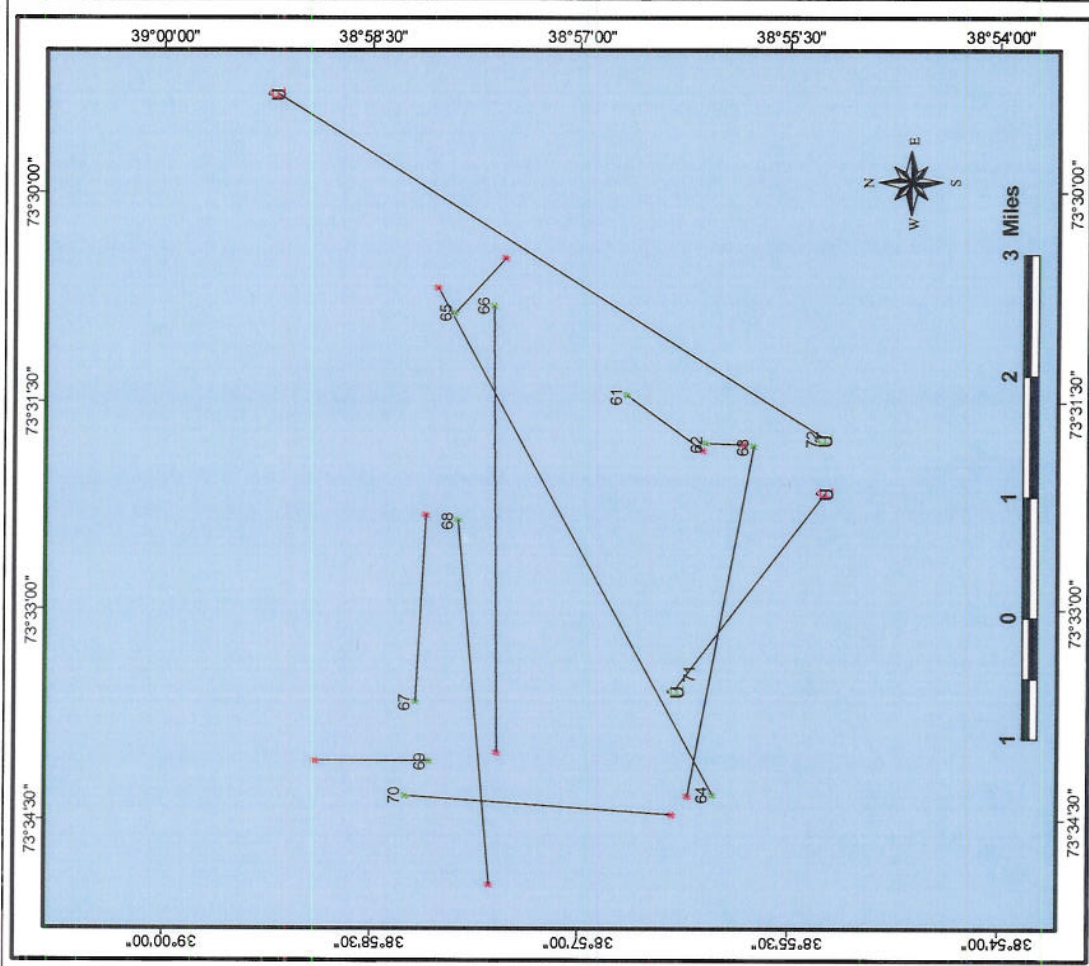


Figure 7
Turtle Take #7
FV Pursuit
October 1, 2003

- # Start of tow
- # End of tow
- ⊔ End of tow (where take occurred)
- ⊔ Start of tow (where take occurred)

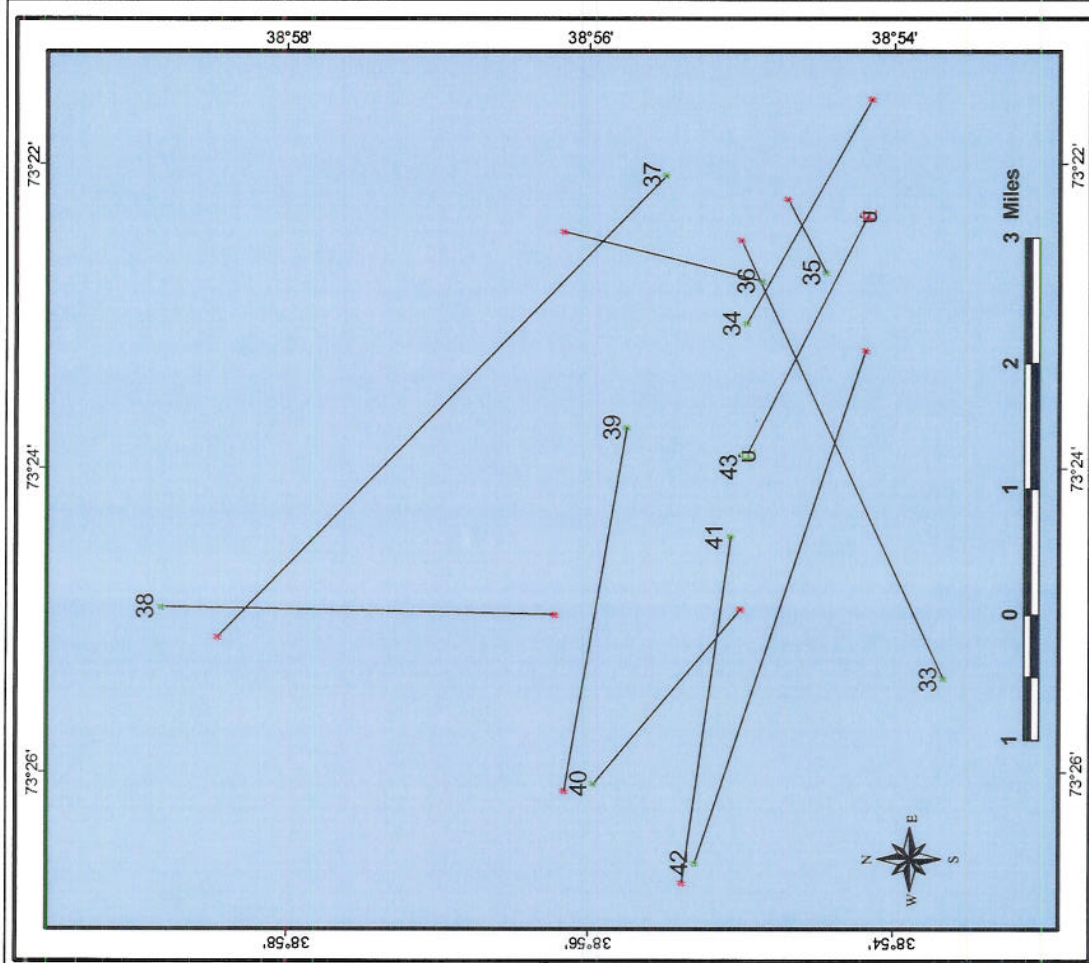
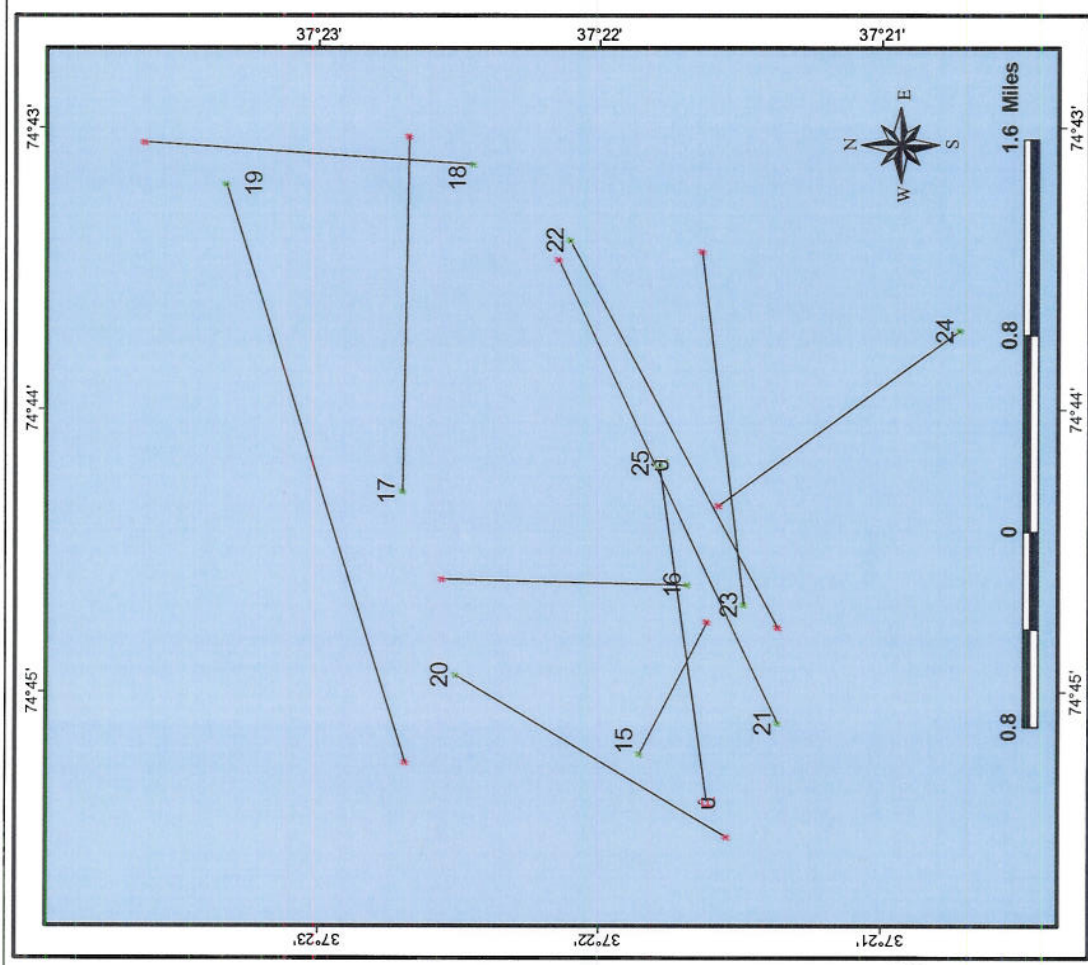


Figure 8

**Turtle Take #8
FV Defiant
October 2, 2004**

- # Start of tow
- # End of tow
- End of tow
(where take occurred)
- Start of tow
(where take occurred)



APPENDIX

Laminated Placards:

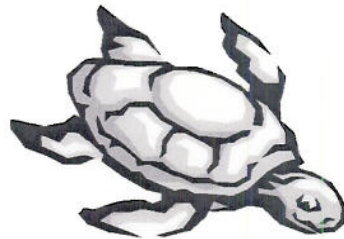
1. Wheelhouse Card: Turtle Interactions
 "Sea Turtles & You: Avoiding Interactions"

2. Wheelhouse Card: Turtle Chains
 "Rigging of Turtle Chains"

3. Turtle Interaction Reports
 Turtle Takes 1-6

Sea Turtles & You:

Avoiding Interactions



It is the responsibility of each and every fishing vessel captain to avoid the capture and injury of sea turtles, which are protected under the Endangered Species Act. You can take practical measures to reduce sea turtle interactions and reduce mortality of those accidentally caught in scallop dredge gear. By working together to avoid taking turtles, we can prevent restrictive government regulations.

Sea Turtle Protection Guidelines:

- ◆ Follow these procedures when turtles are present in your operating area:
 - Do not set dredges if you see turtles in your wake; relocate to another area.
 - Alert other scallop vessels to the presence of turtles.
 - Do not steam or jog with the dredge frame in the water.
 - Stop the dredge on the way up for 30 seconds at the 10-fathom mark.
 - Observe the dredge when it comes alongside and carefully check for turtles.
 - If a turtle is in or on the dredge, handle gear carefully to avoid injury while dumping.

If You Catch a Turtle:

- ◆ Sea turtles that are actively moving or dead must be released with engines *out of gear*.
- ◆ Turtles taken must not be consumed, sold, landed, or kept below deck.
- ◆ A turtle is only considered to be dead if its muscles are stiff (rigor mortis) or the flesh is rotting. All other inactive turtles are considered to be comatose.
- ◆ Sea turtles that are comatose or inactive must be resuscitated before release:
 - Place turtle on its bottom shell right side up, and elevate hindquarters at least 6 in.
 - Periodically rock the turtle gently by lifting each side of the shell, in turn, at least 3 in.
 - Gently touch the eye and pinch the tail periodically to see if there is a response.
 - Sea turtles being resuscitated must be shaded and kept wet using damp cloths.
 - Continue resuscitation attempts for at least 4 hours and preferably, 24 hours.
- ◆ If an observer is onboard, make sure accurate and detailed information is recorded.

Remember, comatose turtles returned to the sea will drown!
Resuscitation is a must!

Share other ideas on ways to avoid turtle interactions.



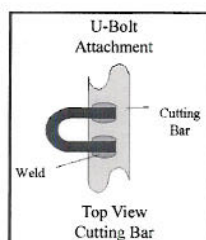
**FISHERIES
SURVIVAL
FUND**

RIGGING OF TURTLE CHAINS

In 2003, as part of a cooperative research program 12 fishing trips were conducted by the scallop industry in which one dredge was modified with turtle chains. In 2,500 observed tows, seven turtles were caught, but none on the side with turtle chains.

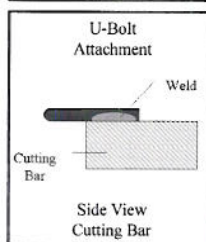
The scallop industry needs to take proactive measures to avoid sea turtle takes in order to minimize restrictions on the fishery. The preliminary success of the turtle chains strongly suggests that scallop vessels fishing between May and October south of Long Island rig turtle chains on their dredges.

The photograph on the reverse side pictures a turtle chain. As shown, it is simply a modified rock chain arrangement constructed of a lighter, but stronger, chain.



Chains: Use 3/8-inch Grade 70 or Trawlex chain, long or short link. This hardened steel chain reduces wear and stretching. It is significantly lighter but has the same breaking strength of a standard 5/8-inch sweep chain.

Hanging: Up and downs are hung from the back of the cutting bar. (See drawings.) Starting at the center and working toward each shoe, "U" bolts are welded 14 inches apart. We recommend for 14-foot to 15-foot dredges, using 11 up and downs, and on 11-foot to 13-foot dredges, using 9 up and downs.



Generally, 6 ticklers are hung running along the sweep, with the first starting at the rear of the shoes. Spaced on a normal sweep arrangement, this should give about a 12 to 13-inch square pattern.

Crossing points between the up and downs can be linked or shackled.

CAUTION: Do not hang the up and downs and ticklers tight onto the sweep; if they are too loose, however, the up and downs will get under the sweep.

We do not have a recommended action that the ticklers be placed outside or inside the up and downs. Some vessels had better luck maintaining scallop catches with the ticklers on the outside.

For additional information, call Ron Smolowitz with the Fisheries Survival Fund at (508) 564-5516, or Bill DuPaul at the Virginia Institute of Marine Science at (804) 684-7163.





New Bedford-style scallop dredge rigged with turtle chain.

Take #1

SEA TURTLE STRANDING AND SALVAGE NETWORK - STRANDING REPORT

OBSERVER'S NAME / ADDRESS / PHONE:

First David M.I. B Last Rudders

Affiliation VIMS

Address _____

Area code/Phone number 804 694-7531

STRANDING DATE:

Year 2003 Month 03 Day 18

Turtle number by day 70054

State coordinator must be notified within 24 hrs:

this was done by ☐ phone (804)684-7313

☐ email ☐ fax (804)684-7327

☐ Toll-free stranding hotline 1-800-433-1005

SPECIES: (check one)

☒ CC = Loggerhead

☐ CM = Green

☐ DC = Leatherback

☐ EI = Hawksbill

☐ LK = Kemp's Ridley

☐ LO = Olive Ridley

☐ UN = Unidentified

Check Unidentified if not positive. Do Not Guess.

Carcass necropsied? ☐ Yes ☒ No

Photos taken? ☒ Yes ☐ No

Species verified by state

coordinator? ☐ Yes ☒ No

SEX:

☒ Undetermined

☐ Female ☐ Male

Does tail extend beyond carapace?

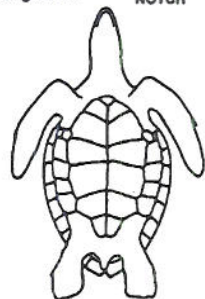
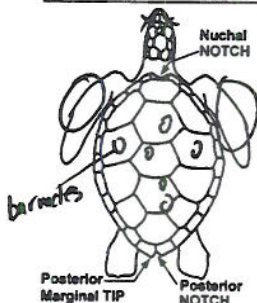
☐ Yes; how far? _____ cm / in

☒ No

How was sex determined?

☐ Necropsy

☐ Tail length (adult only)



STRANDING LOCATION:

☒ Offshore (Atlantic or Gulf beach) ☐ Inshore (bay, river, sound, inlet, etc)

State off Charlotte County _____

Descriptive location (be specific) _____

Latitude 37° 51.75 Longitude 74° 39 126

CONDITION: (check one)

☐ 0 = Alive

☒ 1 = Fresh dead

☐ 2 = Moderately decomposed

☐ 3 = Severely decomposed

☐ 4 = Dried carcass

☐ 5 = Skeleton, bones only

FINAL DISPOSITION: (check)

☐ 1 = Left on beach where found; painted? ☐ Yes* ☐ No(5)

☐ 2 = Buried: ☐ on beach / ☐ off beach;

carcass painted before buried? ☐ Yes* ☐ No

☐ 3 = Salvaged: ☐ all / ☐ part(s), what/why? _____

☐ 4 = Pulled up on beach/dune; painted? ☐ Yes* ☐ No

☐ 6 = Alive, released

☐ 7 = Alive, taken to rehab. facility, where? _____

☒ 8 = Left floating, not recovered; painted? ☐ Yes* ☒ No

☐ 9 = Disposition unknown, explain _____

*If painted, what color? _____

TAGS: Contact state coordinator before

disposing of any tagged animal!!

Checked for flipper tags? ☒ Yes ☐ No

Check all 4 flippers. If found, record tag

number(s) / tag location / return address

PIT tag scan? ☐ Yes ☒ No

If found, record number / tag location

Coded wire tag scan? ☐ Yes ☒ No

If positive response, record location (flipper)

Checked for living tag? ☒ Yes ☐ No

If found, record location (scute number & side)

CARAPACE MEASUREMENTS: (see drawing)

Using callipers

Straight length (NOTCH-TIP) _____ cm / in

Minimum length (NOTCH-NOTCH) _____ cm / in

Straight width (Widest Point) _____ cm / in

Using non-metal measuring tape

Curved length (NOTCH-TIP) 32.5 cm / in

Minimum length (NOTCH-NOTCH) 32 cm / in

Curved width (Widest Point) 31 cm / in

Weight ☐ actual / ☐ est. _____ kg / lb

Mark wounds / abnormalities on diagrams at left and describe below (note tar or oil, gear or debris entanglement, propeller damage, epibiotas, papillomas, emaciation, etc.). Please note if no wounds / abnormalities are found.

head injuries near eye
two front flippers damaged

6:45-8:03

Take #2

SEA TURTLE STRANDING AND SALVAGE NETWORK - STRANDING REPORT

OBSERVER'S NAME / ADDRESS / PHONE:

First Christian M.I. H Last HagerAffiliation JEMSAddress 3Area code/Phone number (814) 684-7555

STRANDING DATE:

Year 2003 Month 03 Day 06Turtle number by day 00

State coordinator must be notified within 24 hrs;

this was done by ☐ phone (804)684-7313☐ email ☐ fax (804)684-7327☐ Toll-free stranding hotline 1-866-493-1085

SPECIES: (check one)

☒ CC = Loggerhead☐ CM = Green☐ DC = Leatherback☐ EI = Hawksbill☐ LK = Kemp's Ridley☐ LO = Olive Ridley☐ UN = Unidentified

Check Unidentified if not positive. Do Not Guess.

Carcass necropsied? ☐ Yes ☐ NoPhotos taken? ☒ Yes ☐ No

Species verified by state

coordinator? ☐ Yes ☐ No

SEX:

☒ Undetermined☐ Female ☐ Male

Does tail extend beyond carapace?

☐ Yes; how far? cm / in☒ No

How was sex determined?

☐ Necropsy☒ Tail length (adult only)

STRANDING LOCATION:

☒ Offshore (Atlantic or Gulf beach) ☐ Inshore (bay, river, sound, inlet, etc)State VA County Descriptive location (be specific) Latitude N 37 15.535Longitude 74 44.434

CONDITION: (check one)

☒ 0 = Alive☐ 1 = Fresh dead☐ 2 = Moderately decomposed☐ 3 = Severely decomposed☐ 4 = Dried carcass☐ 5 = Skeleton, bones only

FINAL DISPOSITION: (check)

☐ 1 = Left on beach where found; painted? ☐ Yes* ☐ No/5☐ 2 = Buried: ☐ on beach / ☐ off beach;carcass painted before buried? ☐ Yes* ☐ No☐ 3 = Salvaged: ☐ all / ☐ part(s), what/why? ☒ 4 = Pulled up on beach/dune; painted? ☐ Yes* ☐ No☒ 6 = Alive, released☐ 7 = Alive, taken to rehab. facility, where? ☐ 8 = Left floating, not recovered; painted? ☐ Yes* ☐ No☐ 9 = Disposition unknown, explain *If painted, what color?

TAGS: Contact state coordinator before disposing of any tagged animal!!

Checked for flipper tags? ☐ Yes ☐ No

Check all 4 flippers. If found, record tag

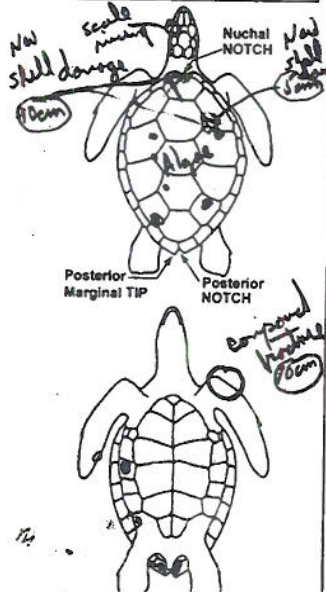
number(s) / tag location / return address PIT tag scan? ☐ Yes ☒ NoIf found, record number / tag location Coded wire tag scan? ☐ Yes ☒ NoIf positive response, record location (flipper) Checked for living tag? ☐ Yes ☒ NoIf found, record location (scute number & side)

CARAPACE MEASUREMENTS: (see drawing)

Using calipers

Straight length (NOTCH-TIP) Circle unitMinimum length (NOTCH-NOTCH) cm / inStraight width (Widest Point) cm / in

Using non-metal measuring tape

Curved length (NOTCH-TIP) 71.3 Circle unitMinimum length (NOTCH-NOTCH) 70 cm / inCurved width (Widest Point) 73 cm / inWeight ☐ actual / ☒ est. 45 kg (lb)

Mark wounds / abnormalities on diagrams at left and describe below (note tar or oil, gear or debris entanglement, propeller damage, epibiota, papillomas, emaciation, etc.). Please note if no wounds / abnormalities are found.

compound fracture to left front flipper
shell damage to left carapace, left nuchal
notch and right dorsal carapace

row 134 SEA

2002-2003

Table Chains on ledge are from top of sweep and V bottom sweep



Take #4

SEA TURTLE STRANDING AND SALVAGE NETWORK - STRANDING REPORT

OBSERVER'S NAME / ADDRESS / PHONE:
 First: John M.I. D Last Lange Jr
 Affiliation VIMS
 Address 1667 Azalea Point Rd
Gloucester Point VA 23062
 Area code/Phone number 804 684 9522

STRANDING DATE:
 Year 2003 Month 09 Day 03
 Turtle number by day 011

State coordinator must be notified within 24 hrs:
 this was done by ☐ phone (804)684-7313
☐ email ☐ fax (804)684-7327 N/A
☐ Toll-free stranding hotline 1-866-493-1085

SPECIES: (check one)

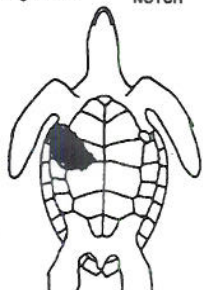
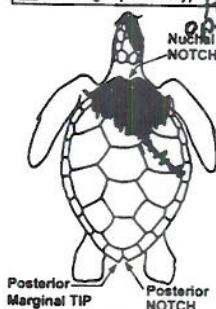
- ☒ CC = Loggerhead
☐ CM = Green
☐ DC = Leatherback
☐ EI = Hawksbill
☐ LK = Kemp's Ridley
☐ LO = Olive Ridley
☐ UN = Unidentified

Check Unidentified if not positive. Do Not Guess.

Carcass necropsied? ☐ Yes ☒ No
 Photos taken? ☒ Yes ☐ No
 Species verified by state coordinator? ☐ Yes ☒ No

SEX:

☐ Undetermined
☒ Female ☐ Male
 Does tail extend beyond carapace?
☐ Yes; how far? _____ cm / in
☒ No
 How was sex determined?
☒ Necropsy = visual of ovaries
☐ Tail length (adult only)



STRANDING LOCATION: ☒ Offshore (Atlantic or Gulf beach) ☐ Inshore (bay, river, sound, inlet, etc)
 State VA County _____
 Descriptive location (be specific) _____

Latitude 38 04 29 Begin End 38 08 90 Longitude 74 29 43 Begin End 74 26 96

CONDITION: (check one)

- ☐ 0 = Alive
☒ 1 = Fresh dead
☐ 2 = Moderately decomposed
☐ 3 = Severely decomposed
☐ 4 = Dried carcass
☐ 5 = Skeleton, bones only

TAGS: Contact state coordinator before disposing of any tagged animal!!

Checked for flipper tags? ☒ Yes ☐ No
 Check all 4 flippers. If found, record tag number(s) / tag location / return address
N/A

PIT tag scan? ☐ Yes ☒ No
 If found, record number / tag location
N/A

Coded wire tag scan? ☐ Yes ☒ No
 If positive response, record location (flipper)
N/A

Checked for living tag? ☒ Yes ☐ No
 If found, record location (scute number & side)
N/A

FINAL DISPOSITION: (check)

- ☐ 1 = Left on beach where found; painted? ☐ Yes* ☐ No(5)
☐ 2 = Buried: ☐ on beach / ☐ off beach; carcass painted before buried? ☐ Yes* ☐ No
☐ 3 = Salvaged: ☐ all / ☐ part(s), what/why? _____
☐ 4 = Pulled up on beach/dune; painted? ☐ Yes* ☐ No
☐ 5 = Alive, released
☐ 6 = Alive, taken to rehab. facility, where? _____
☒ 7 = Left floating, not recovered; painted? ☒ Yes* ☐ No
☐ 8 = Disposition unknown, explain _____

*If painted, what color? Orange "VIMS"

CARAPACE MEASUREMENTS: (see drawing)

Using calipers
 Straight length (NOTCH-TIP) 65 Circle unit
 Minimum length (NOTCH-NOTCH) 61.5 cm / in
 Straight width (Widest Point) 61.5 cm / in
 Using non-metal measuring tape
 Curved length (NOTCH-TIP) 74.5 Circle unit
 Minimum length (NOTCH-NOTCH) 73 cm / in
 Curved width (Widest Point) 71 cm / in
 Weight ☐ actual / ☒ est. ~76 kg / lb

Mark wounds / abnormalities on diagrams at left and describe below (note tar or oil, gear or debris entanglement, propeller damage, epibiota, papillomas, emaciation, etc.). Please note if no wounds / abnormalities are found.

Insides missing; anterior portion of carapace crushed, skull crushed above right eye; plastron crushed on right side just posterior to right front flipper.

#2003-24

Take 5

SEA TURTLE STRANDING AND SALVAGE NETWORK - STRANDING REPORT

OBSERVER'S NAME / ADDRESS / PHONE:

First D M.I. Last duPaulAffiliation UMMS

Address _____

Area code/Phone number _____

STRANDING DATE:

Year 20 03 Month 04 Day 04Turtle number by day 04

State coordinator must be notified within 24 hrs;

this was done by ☐ phone (804)684-7313☐ email ☐ fax (804)684-7327☐ Toll-free stranding hotline 1-866-493-1085

SPECIES: (check one)

☒ CC = Loggerhead☐ CM = Green☐ DC = Leatherback☐ EI = Hawksbill☐ LK = Kemp's Ridley☐ LO = Olive Ridley☐ UN = Unidentified

Check Unidentified if not positive. Do Not Guess.

Carcass necropsied? ☐ Yes ☐ NoPhotos taken? ☐ Yes ☐ NoSpecies verified by state coordinator? ☐ Yes ☐ No

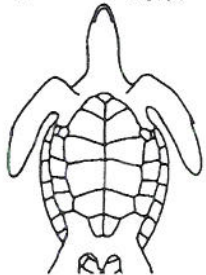
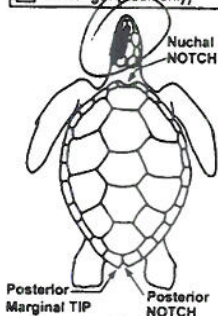
SEX:

☐ Undetermined☐ Female ☐ Male

Does tail extend beyond carapace?

☐ Yes; how far? _____ cm / in☐ No

How was sex determined?

☐ Necropsy☐ Tail length (Adult only)STRANDING LOCATION: ☒ Offshore (Atlantic or Gulf beach) ☐ Inshore (bay, river, sound, inlet, etc)

State _____ County _____

Descriptive location (be specific) _____

Latitude Tow. In. Longitude _____

CONDITION: (check one)

☒ 0 = Alive☐ 1 = Fresh dead☐ 2 = Moderately decomposed☐ 3 = Severely decomposed☐ 4 = Dried carcass☐ 5 = Skeleton, bones only

FINAL DISPOSITION: (check)

☐ 1 = Left on beach where found; painted? ☐ Yes* ☐ No(5)☐ 2 = Buried: ☐ on beach / ☐ off beach;carcass painted before buried? ☐ Yes* ☐ No☐ 3 = Salvaged: ☐ all / ☐ part(s), what/why? _____☐ 4 = Pulled up on beach/dune; painted? ☐ Yes* ☐ No☒ 5 = Alive, released☐ 7 = Alive, taken to rehab. facility, where? _____☐ 8 = Left floating, not recovered; painted? ☐ Yes* ☐ No☐ 9 = Disposition unknown, explain _____

*If painted, what color? _____

TAGS: Contact state coordinator before disposing of any tagged animal!!

Checked for flipper tags? ☐ Yes ☐ No

Check all 4 flippers. If found, record tag number(s) / tag location / return address _____

PIT tag scan? ☐ Yes ☐ No

If found, record number / tag location _____

Coded wire tag scan? ☐ Yes ☐ No

If positive response, record location (flipper) _____

Checked for living tag? ☐ Yes ☐ No

If found, record location (scute number & side) _____

CARAPACE MEASUREMENTS: (see drawing)

Using calipers

Straight length (NOTCH-TIP) _____ cm / in

Minimum length (NOTCH-NOTCH) _____ cm / in

Straight width (Widest Point) _____ cm / in

Using non-metal measuring tape

Curved length (NOTCH-TIP) _____ cm / in

Minimum length (NOTCH-NOTCH) _____ cm / in

Curved width (Widest Point) _____ cm / in

Weight ☐ actual / ☐ est. _____ kg / lb

Mark wounds / abnormalities on diagrams at left and describe below (note tar or oil, gear or debris entanglement, propeller damage, epibiota, papillomas, emaciation, etc.). Please note if no wounds / abnormalities are found.

injured headturtle fell on deck and injured head

Take 6

SEA TURTLE STRANDING AND SALVAGE NETWORK - STRANDING REPORT

OBSERVER'S NAME / ADDRESS / PHONE:

First W M.I. Last DUPAUL
 Affiliation UMMS
 Address _____
 Area code/Phone number _____

STRANDING DATE:

Year 20 00 Month 00 Day 00
 Turtle number by day 00

State coordinator must be notified within 24 hrs;
 this was done by ☐ phone (804)684-7313
☐ email ☐ fax (804)684-7327
☐ Toll-free stranding hotline 1-866-493-1085

SPECIES: (check one)

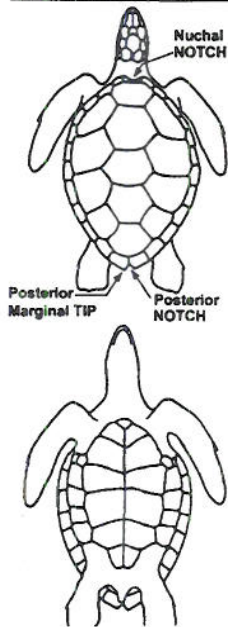
- ☒ CC = Loggerhead
☐ CM = Green
☐ DC = Leatherback
☐ EI = Hawksbill
☐ LK = Kemp's Ridley
☐ LO = Olive Ridley
☐ UN = Unidentified

Check Unidentified if not positive. Do Not Guess.

Carcass necropsied? ☐ Yes ☐ No
 Photos taken? ☐ Yes ☐ No
 Species verified by state coordinator? ☐ Yes ☐ No

SEX:

☐ Undetermined
☐ Female ☐ Male
 Does tail extend beyond carapace?
☐ Yes; how far? _____ cm / in
☐ No
 How was sex determined?
☐ Necropsy
☐ Tail length (adult only)



STRANDING LOCATION:

☐ Offshore (Atlantic or Gulf beach) ☐ Inshore (bay, river, sound, inlet, etc)
 State _____ County _____
 Descriptive location (be specific) TOW 72
 Latitude _____ Longitude _____

CONDITION: (check one)

- ☒ 0 = Alive
☐ 1 = Fresh dead
☐ 2 = Moderately decomposed
☐ 3 = Severely decomposed
☐ 4 = Dried carcass
☐ 5 = Skeleton, bones only

TAGS: Contact state coordinator before disposing of any tagged animal!

Checked for flipper tags? ☐ Yes ☐ No
 Check all 4 flippers. If found, record tag number(s) / tag location / return address

PIT tag scan? ☐ Yes ☐ No
 If found, record number / tag location

Coded wire tag scan? ☐ Yes ☐ No
 If positive response, record location (flipper)

Checked for living tag? ☐ Yes ☐ No
 If found, record location (scute number & side)

FINAL DISPOSITION: (check)

- ☐ 1 = Left on beach where found; painted? ☐ Yes* ☐ No(5)
☐ 2 = Buried: ☐ on beach / ☐ off beach; carcass painted before buried? ☐ Yes* ☐ No
☐ 3 = Salvaged: ☐ all / ☐ part(s), what/why? _____
☐ 4 = Pulled up on beach/dune; painted? ☐ Yes* ☐ No
☐ 5 = Alive, released
☐ 6 = Alive, taken to rehab. facility, where? _____
☐ 7 = Left floating, not recovered; painted? ☐ Yes* ☐ No
☐ 8 = Disposition unknown, explain _____

*If painted, what color? _____

CARAPACE MEASUREMENTS: (see drawing)

Using calipers Circle unit
 Straight length (NOTCH-TIP) _____ cm / in
 Minimum length (NOTCH-NOTCH) _____ cm / in
 Straight width (Widest Point) _____ cm / in
 Using non-metal measuring tape Circle unit
 Curved length (NOTCH-TIP) _____ cm / in
 Minimum length (NOTCH-NOTCH) _____ cm / in
 Curved width (Widest Point) _____ cm / in
 Weight ☐ actual / ☐ est. _____ kg / lb

Mark wounds / abnormalities on diagrams at left and describe below (note tar or oil, gear or debris entanglement, propeller damage, epibiota, papillomas, emaciation, etc.). Please note if no wounds / abnormalities are found.

No injury seen - turtle jumped
off dredge before dredge
brought on board